CELLULOID.

Now there seems to be every probability of glass being, at least partially, superseded by celluloid in negative work, especially out of doors, we may expect soon to find a new subject for discussion in the question as to whether the substance referred to is altogether free from faults in its new application. It may be said, indeed, that the question has already been raised.

If it should be proved that these doubts are well founded, the question suggests itself as to whether the beautiful substance cannot in some way be freed from its baneful ingredients. In other words, whether it cannot be *decamphorated* and *denitrated* without destroying its advantageous features, especially its transparency and flexibility.

With a view of testing the possibility of this we have made a few rough experiments, but not with any very decisive result, at any rate so far as success is concerned, but rather the opposite. With a view of removing, if possible, the camphor, a sheet of celluloid was digested with ordinary methylated alcohol, which, though at first producing no apparent result, was found in the course of a few hours to have *completely* dissolved it. Here, then, there is no possibility of dissolving out the camphor, since the latter lends its aid to the alcohol in dissolving the pyroxyline.

Another sheet accurately weighed (like the last) was submitted to the heat of about 180° Fahr. in a gas oven for a period of twelve hours; at the end of that time it was physically changed to the extent of being badly curled and crumpled by the heat, though that might possibly be remedied by proper precautions. But the loss in weight after twelve hours "stoving" did not amount to *one-tenth of one per cent* on the total weight. So here, again, there does not appear much hope of driving off the camphor in vapor without hopelessly spoiling the material.

Of a number of experiments in denitrating, one may be specially mentioned. If the celluloid be immersed in strong concentrated sulphuric acid, no apparent action takes place; but if an equal volume of water be added, the sudden and intense heat evolved causes a deep yellow coloration of both celluloid and liquid, and the evolution of a powerful empyreumatic, mixed up with which camphor is plainly recognizable. After a very short time the action ceases and the color leaves the solution.

If the celluloid be now taken out, washed, and dried, it will be found to have lost considerably in weight and to have had its surface eaten away irregularly, or corroded in much the same way as glass when treated with dilute hydrofluoric acid. Returned to the dilute sulphuric acid and boiled, no further action takes place until ebullition has gone on for some time, when the liquid commences to turn yellow, but the color at first quickly disappears on stirring. Gradually, however, it becomes stronger and more persistent, and at the same time strong nitrous fumes are given off, these being apparently the cause of the yellowing. Finally, the color becomes brown, and the celluloid dissolves entirely, forming a deep brown solution.

Now this seems to prove that *as celluloid* the substance for a long time resists even boiling sulphuric acid, but gradually it is denitrated, and then *as cellulose* is carbonized and destroyed by the acid. Thus the possibility of denitration is proved, but whether it can be done practically without destruction is a question.

If this can be accomplished, one at least of the possible weak points in celluloid will be removed.—*Br. Jour.*

PNEUMATIC MOULDING MACHINE.*

The author began by explaining the general principle of moulding machines which had preceded the one he was about to describe. The system of moulding by machinery commenced by machines in which the sand was rammed or pressed by a flat plate. The next step was taken when the pattern was mechanically withdrawn after the mould was made. Subsequently the two systems were united, and many machines were made in which there was combined a flat presser and a withdrawable pattern. These were by far the more numerous class in the market, but there were other systems designed to expedite the removal and casting of the boxes, which had been largely adopted. Instances of these were found in the plan adopted by Messrs. Alley & McLellan, of Glasgow, in casting fence post spikes, and at Goudienne, in France, in dealing with stove grate work. The chief difficulties met with were those arising in the ramming of the sand. It was exceedingly difficult, and, as the author contended, practically impossible, to get a box properly rammed by hand so that the sand throughout the mould was of uniform density. This was a matter of prime importance, as he believed most of the evils existing in connection with castings were due to faults or variations in the density of the mould. The Atlas Engine Works Company of Indianapolis for commercial reasons determined to reduce the engines made by them to five sizes, and it therefore became a matter of importance to devise some means of reducing the cost of moulding. Owing to the different depths necessary in the box, the proper pressing of the sand was a difficult matter, and, after a number of experiments with a divided presser plate had been made, india-rubber bags, into which air under pressure could be admitted, were tried. These succeeded admirably, and the machine was rapidly developed. At first the moulding boxes were placed in a fixed box, but eventually the rotary head machine, which we illustrate on the next page, was adopted. This machine is constructed, as shown, with two heads, which are swivelled on a centre rod, forming one of the pillars of the machine. The pattern is raised or lowered by means of the levers shown, which can be locked so that it is impossible for them to be moved at the wrong time. When the boxes are in the position shown, one is ready for being rammed up, while the other is ready for the removal of the box, both operations taking place simultaneously. The pressing head is constructed with the required number of bags, according to the size of the machine, the bags being held in the top box. When the box is brought into position under the presser, compressed air is admitted and first actuates a piston below the bottom plate, thus raising it and the box until the latter is brought in contact with the bags. The reason for this construction is that there must necessarily be a little space to allow of the free movement of the head, and it is necessary to fill this space before the bags are put under pressure. As soon as the box is sufficiently raised, a valve is automatically opened and the air admitted to the bags, thus ramming the box in a few seconds. The pressure of air used is 50 lb. per square inch, which is found enough for practical purposes. After ramming, the pressure is relieved, the head swung round, the pattern drawn downwards, and the box removed. The sand is supplied from a hopper placed above the outward head; the used sand, after being riddled and mixed, is brought back by a travelling band and elevator to

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